Fill 'Em Up

Summary

This activity will help students to learn the concept of volume through hands-on activities.

Materials

Invitation to Learn

Various containers (size & shape)

Instructional Procedures

- *How Much Will It Hold?* (pdf)

Clear geometric solids
Rice
Lentils
Water
Funnels
50ml graduated cylinders
Paper towels

Additional Resources

Books

Math On Call, ISBN 0669457701

Background for Teachers

Volume of a three-dimensional figure is the amount of space inside the figure. While students can be shown and taught the formula to determine a volume measurement, they often need an exploration activity to actually comprehend the more abstract concept. This lesson may serve as an introduction to the concept of volume by providing a hands-on experience to develop an understanding of volume and one way in which it can be measured without the use of a formula.

As students measure the volume of the shapes several relationships should come to light. The volume of the cube is three times the volume of the square pyramid. The volume of a pyramid is 1/3 the volume of a prism with the same base area and height. The volume of a cone is 1/3 the volume of a cylinder with the same base area and height. The sphere is 2/3 the volume of a cylinder.

Using liters to measure the volume transfers to the concept of cubic centimeters since there are 1000 cubic centimeters in a liter and 1000 milliliters in a liter. Students need to become aware that should they overflow the solid or not fill completely, measurements can be inaccurate. If all is done correctly, they should have a close match. After having students measure the volume with milliliters, and providing the formula for area, they can then measure the prism's base and height checking for accuracy.

Instructional Procedures

Invitation to Learn

Collect and display a variety of shaped containers. Have the students list the containers in order, least to greatest based on their estimate of the volume of each, in their math journal. Ask students to share their ideas, thoughts and methods for determining the container with the greatest volume. Ask students what volume is? What did they look at? Is the height more important than the width or circumference? Where do they see a volume measurement in real life? How do we measure volume? Share with students which containers are larger than others with a quick measurement of the volume of several of the containers.

Instructional Procedures

Display a small container of rice, lentils, and water which students might use to measure volume. Question students as to which material would give the best measurement and why? Demonstrate proper measurement, with rice and water, measuring the volume of the small rectangular prism. Compare the measurements and ask which material provides a more accurate measurement. Why?
Distribute *How Much Will It Hold?* to each student.
Working with a partner, students will use the eight geometric solids on their table to estimate which has the least volume and list in order least to greatest.
Using a 50ml graduated cylinder and funnel, one student will fill chosen solid and note on chart the volume of the solid. Students will use the same material to measure all of their shapes. Have different pairs use different materials at each table. One pair will use water, one lentils and one group will use rice.
Partners will complete measurement a second time to assure accuracy.
Repeat the same process with all eight shapes.
Students will list solids, greatest volume to least, and compare with estimation.
Group students according to the material used to measure volume. Have groups share their findings. Listen as students attempt to explain and question differences in findings.
Ask students to compare the relationship between different solids. Do they see any relationships? If students can see a similarity, have them share and discuss their findings. If they cannot see a relationship, aim them toward the cube and square pyramid. Was their measurement of the square pyramid 1/3 of the cube? What are some ways in which they can prove their findings to be true? Can they see any other similarities with other shapes?

Strategies for Diverse Learners

For advanced learners, let them discover the relationship between liters and cubic centimeters using centimeter cubes and water.
Special needs students can better successfully measure using water from squirt bottles to prevent spilling.
Science- integrates math to science unit of Matter.

Extensions

Family Connections

Students can find a container at home with the volume listed. Compare the volume to another container that is not marked. Is the volume greater? How can they measure the volume? Share with the class their findings.
Students can answer why a cereal box never seems to be full when opened the first time.

Assessment Plan

Performance assessment-completed chart of measurements.
Journaling-written explanation of relationship of shapes discovered in measuring and how those can be proven. Have students explain possible reasons in differences of volume. Can they suggest ways to increase accuracy?
Provide another geometric shape for student to measure volume.

Bibliography

Ancess, J. (2004). Snapshots of meaning-making classrooms. *Educational Leadership*. 62(1). 36-40.
Teachers have a responsibility to design instruction enabling all students to learn in ways that suit them best. Providing small group activities allows students to share their own and their peers' individual strategies for solving math problems.

Rushton, S., Larkin E. Shaping the learning environment: connecting developmentally appropriate practices to brain research. *Early Childhood Education Journal*. 29(1). 25- 33.

Studies reviewed show that pairing brain research with developmentally appropriate practices sets the stage for solid learning. Being aware of both and providing hands-on activities that cater to different learning modalities and stimulate the different regions of the brain makes learning more interesting promoting deeper understanding.

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